REMARKS

This is a response to the non-final Office Action mailed on December 16, 2011. No fee is due in connection with this response. The Director is authorized to charge any fees that may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 3712036-00742 on the account statement.

Claims 1-8 and 10-29 are pending in this application. Claim 9 was previously canceled without prejudice or disclaimer, and Claims 14-29 were previously withdrawn from consideration. In the Office Action, Claims 1-8 and 10-13 are rejected under 35 U.S.C. §112. Claims 1-8 and 10-13 are further rejected under 35 U.S.C. §103. In response, Claim 1 has been amended, and Claim 30 has been newly added. The amendments do not add new matter. In view of the amendments and/or for at least the reasons set forth below, Applicants respectfully submit that the rejections should be withdrawn.

In the Office Action, Claims 1-8 and 10-13 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Patent Office asserts that the phrase "greater than 55% to 60%" is indefinite because: (1) it is unclear whether the phrase is referring to greater than 55% or greater than 60%; and (2) the phrase includes a broad limitation (greater than 55%) and a narrower limitation (greater than 60%). See, Office Action, page 2, lines 15-23. In response, Applicants have amended Claim 1 to recite "greater than 55%." This amendment is supported in the Specification at, for example, page 3, paragraph 50.

Accordingly, Applicants respectfully request that the rejection of Claims 1-8 and 10-13 under 35 U.S.C. §112, second paragraph, be withdrawn.

In the Office Action, Claims 1-8 and 10-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,345,781 to Fels et al. ("*Fels*") in view of U.S. Patent No. 5,024,066 to Goavec ("*Goavec*") and U.S. Patent No. 5,221,504 to Capelle ("*Capelle*"). Applicants respectfully traverse the rejection for at least the reasons set forth below.

Currently amended independent Claim 1 recites, in part, a low temperature extrusion process for energy optimized, viscosity adapted micro-structuring of frozen aerated masses, the process comprising the steps of: locally adjusting a rotational screw speed of an extruder screw; locally adjusting a mass flow rate of a partially frozen, aerated mass, the mass flow rate adjusted by a positive replacement pump installed at an extruder inlet; locally adjusting, in at least 3 zones of the extruder screw, width variation of cuts in a screw flight; and locally adjusting a cooling temperature at an inner wall of an extruder housing, the cooling temperature adjusted by an

evaporation pressure of refrigerant, the process providing a mechanical treatment of the partially frozen, aerated mass over a length of an extruder screw channel zone with respect to its local viscosity, performed such that, in each of a subsequent zone there is a dispersing of air bubbles/air cells and at a same time a temperature decrease and related increase of the frozen water fraction is achieved, the process further providing a viscosity-adapted increase in shear treatment in a first 25% to 70% of a length of the extruder screw measured from an extruder inlet such that after about half or two-thirds of the extruder screw length a freezing degree of greater than 55% frozen water fraction related to the freezable water is reached.

The present disclosure is based on the optimization of the energy input provided during a low temperature freezing extrusion process applied to a partially frozen mass. The present disclosure has the double aim of (i) generating a homogeneous fine microstructure in the frozen mass, and (ii) optimizing the conditions for the transfer of dissipated and phase transition heat generated during the process.

More particularly, the present claims are based on the fact that the energy input provided during the extrusion process is modified along the extruder length, by zones, thus generating an input which is locally (in each zone) adapted to the local heat transfer. Practically, as the partially frozen mass goes along the extruder, its viscosity increases (with the increase of frozen water fraction) and as a consequence the dissipated heat provided by the friction and the crystallization increases as well. A gradient of mechanical energy is provided by adjusting the shear treatment to the local viscosity of the mass, which allows finer dispersing of the microstructure components (ice crystals, air bubbles/air cells, fat globule agglomerates) and optimized conditions for the heat transfer.

Even if combinable, the cited references fail to disclose or suggest each and every element of independent Claim 1. Specifically, the cited references alone or in combination fail to disclose or suggest a low temperature extrusion process comprising: (1) locally adjusting a rotational screw speed of an extruder screw; (2) locally adjusting, in at least 3 zones of the extruder screw, width variation of cuts in a screw flight; and (3) providing a viscosity-adapted increase in shear treatment in a first 25% to 70% of a length of the extruder screw measured from an extruder inlet such that after about half or two-thirds of the extruder screw length a freezing degree of greater than 55% frozen water fraction related to the freezable water is reached as required by independent Claim 1.

The Patent Office alleges that *Fels* discloses locally adjusting a rotational screw speed of an extruder screw. See, Office Action, page 3, lines 20-21. However, the portion of *Fels* relied on by the Patent Office merely teaches three shafts (23, 39 and 46), rather than three sections of a screw, each having a certain speed. See, *Fels*, column 11, lines 27-42; Fig. 3. Although *Fels* teaches a double screw extruder system, nowhere does *Fels* teach or even suggest locally adjusting a rotational screw speed of its extruder screws such that different zones along the length of the screw from the extruder inlet to the extruder outlet can have different rotational speeds. See, *Fels*, column 12, lines 48-51; Fig. 4.

The Patent Office relies on *Goavec* merely for the disclosure of providing a mixture to an extruder inlet via a volumetric pump and constantly measuring the output of the pump using a flow sensor. See, Office Action, page 4, lines 11-31; page 5, lines 1-2. The Patent Office relies on *Capelle* merely as support for providing width variation cuts in a screw flight. See, Office Action, page 5, lines 30-32; page 6, lines 1-24. Nowhere do *Goavec* or *Capelle* teach or suggest locally adjusting a rotational screw speed of an extruder screw, nor does the Patent Office cite support in those references for such claimed element. Therefore, even if combinable, the cited references fail to disclose or suggest locally adjusting a rotational screw speed of an extruder screw.

Fels, *Goavec* and *Capelle* further fail to disclose or suggest locally adjusting, in at least 3 zones of the extruder screw, width variation of cuts in a screw flight as required, in part, by independent Claim 1. The Patent Office admits that *Fels* and *Goavec* are silent regarding locally adjusting width variation of cuts in a screw flight in at least three zones of the extruder screw. See, Office Action, page 5, lines 30-32; page 6, lines 1-2. Nevertheless, the Patent Office alleges that *Capelle* teaches providing width variation of cuts in a screw flight, and since *Fels* and *Capelle* are both directed to energy optimized extrusion, one of ordinary skill in the art would have been motivated to combine the teachings of *Capelle* and *Fels*. See, Office Action, page 6, lines 3-24. However, the portion of *Capelle* relied on by the Patent Office merely teaches decreasing and then increasing the channel depth in the longitudinal direction of the extruder. See, *Capelle*, column 2, lines 64-66. Nowhere does *Capelle* teach or even suggest providing "cuts" in its screw flights, or locally adjusting the width variation of such cuts in at least three zones of the screw. Thus, even if combinable, the cited references fail to disclose or suggest locally adjusting, in at least 3 zones of the extruder screw, width variation of cuts in a screw flight in accordance with Claim 1.

Moreover, even if combinable, *Fels*, *Goavec* and *Capelle* fail to disclose or suggest providing a viscosity-adapted increase in shear treatment in a first 25% to 70% of a length of the extruder screw measured from an extruder inlet as required, in part, by independent Claim 1. The Patent Office asserts that *Fels* discloses adapting process parameters to achieve a desired aerated ice cream product and optimizing the tailoring of a mechanical energy input. See, Office Action, page 5, lines 3-29. However, *Fels* is entirely directed to an extrusion process using a homogeneous mechanical energy input:

> The present invention addresses the problem of designing a device of the kind described above in such a manner that the product will be cooled down to storage temperature on a continuous basis by a sensibly designed, relatively simple configuration, and can be ***homogeneously stressed*** and well-mixed in the process, with a uniform and homogeneous removal of heat. . . .
>
> The device according to the invention for deep freezing--preferably to storage temperature--of ice cream or other fluids down to temperatures of less than -10° C with simultaneous production of a creamy condition, implements ***an essentially homogeneous, mechanical energy input***, based on the use of a special double screw system. . . .
>
> b) The screw channel is designed so that, depending on the flow behavior of the substance being treated, nearly no 'flow dead zones' are created, and thus a ***homogeneous, mechanical energy input*** will be assured. . . .
>
> At the same time, a ***homogeneous stressing*** will be ensured by the selection of the screw channel geometry and by the speed of the turning screw, in such a manner that a super-critical load on the 'foam structure' of the aerated ice cream of similar item is prevented, as also is the resultant structural disintegration (in particular: whipping loss).
>
> According to the present invention, ***the input of mechanical energy*** into an extremely flat screw channel under gentle screw meshing ***is performed essentially homogeneously (no local power peaks)***. . . .

See, *Fels*, column 6, lines 17-23, 50-56 and 61-64; column 8, lines 3-9 and 17-20 (emphasis added). Thus, contrary to the Patent Office's assertion, one of ordinary skill in the art would understand that *Fels* does not teach or even suggest increasing the shear treatment in its extruder system along the length of the extruder screw based on the viscosity of the aerated product.

Goavec is entirely directed to improving agitation of a product during freezing using a stirring means comprising an Archimedes' screw furnished on its periphery with scraper knives. See, *Goavec*, Abstract. Nowhere does *Goavec* teach or even suggest varying the shear treatment in the first half or two thirds of its extruder in order to reach a certain fraction of frozen water at that stage, or otherwise increasing the shear treatment in its extruder based on the viscosity of its product.

The Patent Office relies on *Capelle* as support for providing width variation cuts in a screw flight. See, Office Action, page 5, lines 30-32; page 6, lines 1-24. Like *Goavec*, *Capelle* fails to disclose or suggest increasing the shear treatment in its extruder, let alone basing such an increase on the viscosity of its product. As such, even if combinable, the cited references fail to disclose or suggest providing a viscosity-adapted increase in shear treatment in a first 25% to 70% of a length of the extruder screw as required, in part, by Claim 1.

For at least the reasons discussed above, *Fels*, *Goavec* and *Capelle* fail to teach or suggest every element of independent Claim 1. Moreover, *Fels*, *Goavec* and *Capelle* fail to even recognize the advantages, unexpected benefits and/or properties of locally adjusting parameters and thus adapting the energy input along the length of an extruder as a function of the increasing viscosity of a partially frozen mass in accordance with the present claims. As a result, Applicants respectfully submit that independent Claim 1, along with any claims that depend from Claim 1, are novel, nonobvious and distinguishable from the cited references.

Accordingly, Applicants respectfully request that the rejection of Claims 1-8 and 10-13 under 35 U.S.C. §103(a) to *Fels*, *Goavec* and *Capelle* be withdrawn.

Applicants further note that Claim 30 has been newly added. The new claim is fully supported in the Specification at, for example, page 3, paragraph 53; page 4, paragraph 54. No new matter has been added thereby. Applicants respectfully submit that the subject matter as defined in the newly added claim is patentable over the cited art for at least substantially the same reasons discussed above.

For the foregoing reasons, Applicants respectfully request reconsideration of the above-identified patent application and earnestly request an early allowance of the same. In the event there remains any impediment to allowance of the claims which could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate such an interview with the undersigned.

Respectfully submitted,

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